

REMARKS

Claims 1-24 are pending in the subject application. All of the claims stand rejected variously under 35 U.S.C. 102 and/or 103, and on the basis of double-patenting. Some of these grounds of rejection were reinstated following the allowance of several of the claims in a previous office action. New claims 25-35 are added herewith.

Rejection of Claims 1-7, 9 and 11-24 Under 35 U.S.C. 102

Claims 1-7, 9 and 11-24 stand rejected under 35 U.S.C. 102 as being anticipated by the PCT international patent application PCT/US97/07490 of Bernardo Martinez-Tovar. Independent claims 1 and 18 were previously allowed over Martinez-Tovar on the Examiner's understanding that the claim excluded tungsten and was limited to titanium, but upon the Applicant's assertion that "consisting essentially of" left the claim partially open to other metals, the Examiner withdrew the allowance of those claims and claims dependent therefrom.

Claims 1 and 18 both define semiconductor bridge igniters that have a bridge structure consisting essentially of a layer of titanium disposed over a semiconductor material. These claims are based on the Applicant's discovery of unforeseen advantages realized when titanium is used in the metal layer on the semiconductor bridge without tungsten, the exclusion of which is provided by the "consisting essentially of" limitation in both claims. The invention is patentable because the prior art does not teach or suggest a metal layer on a semiconductor bridge that contains titanium without tungsten, or the ensuing advantages that were realized by the Applicant by excluding the tungsten from titanium. Only the Applicant has disclosed and claimed an igniter device in which a semiconductor bridge is covered with a layer of titanium to the exclusion of tungsten.

In view of the comments set forth in the office action mailed August 4, 2003 and subsequent Advisory Action, the Applicant believes that the Examiner misinterprets the scope of the phrase "consisting essentially of a layer of titanium" with regard to what extent that phrase leaves this claim open or closed. "Consisting essentially of" leaves the claim open to elements in addition to those recited in the claim, provided the additional elements do not defeat the novel and basic characteristics of the invention. The subject application states that as a result of using titanium without tungsten, the energy required for the reliable function of the device is significantly reduced relative to a bridge having tungsten (see the specification

at page 3, line 24 through page 4, line 28). This basic and novel characteristic of the invention that would be lost by the inclusion of tungsten on the metal layer.

In view of the description of the invention, the claims may properly be left open to the inclusion of metals in addition to titanium that will not defeat that basic and novel characteristic. Accordingly, the term "consisting essentially of a layer of titanium" in claims 1 and 18 leaves these claims open to metals in addition to titanium, but it excludes any metal that would re-introduce the disadvantage of tungsten, i.e., the high energy consumption required for initiation as for tungsten. The fact that such permissible other metals might be known in the prior art for use in semiconductor bridge igniters without tungsten does not by itself affect the allowability of these claims unless the prior art is shown to suggest the use of titanium without tungsten, which it does not.

To further justify rejecting the claims, the Examiner pointed out that the prior art shows that semiconductor bridge igniter devices with tungsten metal layers thereon can function effectively. However, the Applicant has not asserted that a layer of tungsten on a semiconductor bridge device will render the device non-functional, nor is any such assertion necessary to support the patentability of the claims. Claims 1 and 18 are patentable because the prior art fails to show or suggest the use of titanium on a semiconductor bridge igniter without tungsten. For this reason, the asserted claims, which define SCB devices having a layer of titanium from which tungsten is excluded, are patentably distinct from Martinez-Tovar.

The Examiner has also asserted that the specification is not enabling for any metal other than titanium. This ground of rejection is respectfully traversed because the only metal that the claims require is titanium, and the specification is clearly enabling for titanium. In addition, by comparison to titanium alone and to the prior art (titanium with tungsten), a person of ordinary skill in the art can determine whether a particular added metal imposes the energy requirements for initiation of the device that tungsten does. In this way, it can readily be determined, without undue experimentation, whether a proposed unrecited metal defeats the basic and novel characteristic of the invention obtained by using titanium in the absence of tungsten. For the foregoing reason, the stated ground of rejection of claims 1-11 and 18-20 is respectfully traversed.

Claim 12 defines a semiconductor bridge igniter having a layer of titanium over a bridge of semiconductor material, wherein the titanium has been preconditioned against temperature-induced variations in resistance. In response to Applicant's prior arguments con-

cerning claim 12, the Examiner states that "The issue regarding the layer of titanium has been addressed." It is respectfully submitted that neither this statement nor others made in regard to claim 12 fairly address the arguments made by the Applicant. Claim 12 defines a semiconductor bridge having a particular type of titanium metal compound thereon, i.e., one that has been obtained by a preconditioning process that is nowhere disclosed by Martinez-Tovar. In fact, Martinez-Tovar mentions annealing only in connection with aluminum and tungsten (see page 10, lines 4-23). Accordingly, there appears to be no basis on which to maintain that Martinez-Tovar discloses a semiconductor bridge having a titanium layer of the kind defined in claim 12.

Claim 21 has been canceled, rendering the stated ground of rejection moot. Claim 22, however, contains limitations that provide a clear patentable distinction relative to Martinez-Tovar. In particular, claim 22, as amended, defines a method for initiating an energetic material using a semiconductor bridge igniter in which energy flowing through the semiconductor bridge material melts the metal thereon before the semiconductor material vaporizes. This is not possible with the tungsten-containing bridge of Martinez-Tovar because, as explained in the subject application at page 3, lines 24-27, the vaporization temperature of the silicon is lower than the melting point of tungsten. Therefore, the semiconductor material is incapable of melting the tungsten metal thereon before the semiconductor material vaporizes, as required by claim 22. Accordingly, claims 22-24 all define a patentable distinction relative to Martinez-Tovar.

Rejection of Claims 21-23 Under 35 U.S.C. 102

Claims 21-23 stand rejected under 35 U.S.C. 102 as being anticipated by U.S. Patent 4,976,200 to Benson et al. The Examiner states that the method of operation of a semiconductor igniter device as defined in claim 21 describes the function of the Benson et al device.

Benson et al discloses an initiation device comprising a bridge of semiconductor material on which a layer of tungsten has been deposited. In operation, an energetic material is pressed against the bridge and the silicon bridge and tungsten are vaporized together to form a plasma to initiate the energetic material.

Claim 22 provides a clear distinction of the claimed invention relative to the operation of the Benson et al device for the same reasons that this claim is distinguishable from Martinez-Tovar, i.e., it specifies that the semiconductor material melts the solid metal layer

before the semiconductor materials vaporizes. As acknowledged by the Examiner, the Benson et al device appears to operate only by the simultaneous vaporization of the tungsten layer with the semiconductor material; apparently no melting of the tungsten occurs before the semiconductor material vaporizes. Accordingly, claim 22 is clearly patentably distinct from Benson et al and the stated ground of rejection is respectfully traversed.

Rejection of Claims 1-3, 5, 7, 11 and 18-20 Under 35 U.S.C. 102

Claims 1-3, 5, 7, 11 and 18-20 stand rejected under 35 U.S.C. 102 as being anticipated by German Patent Document DE 19732380 to Weiss.

A translation of Weiss into English was obtained by the Applicant and was submitted with the paper filed November 3, 2003.

Weiss discloses a device that provides a bridge of titanium hydroxide over a layer of insulating material 3 of SiO₂ (Figures 1a-1c, 3-8) or directly on an electrically non-conductive carrier substrate 4 (Figures 2a-2c). The only constituent of the bridge is the titanium hydroxide.

In contrast, claims 1 and 18 clearly describe the bridge structure as having a bridge section extending between two larger pad sections and including both a layer of semiconductor material and the titanium thereon. This feature provides a clear distinction over Weiss, which only shows the titanium hydride in a bridge formation, with the titanium hydride bridge being disposed directly on a larger thermal insulator or on a carrier substrate that does not form a bridge. Weiss shows no bridge formation of semiconductor material on which the titanium hydroxide is disposed. Since claims 1 and 18 and the claims dependent therefrom define a bridge structure that is not shown by Weiss, Weiss cannot properly be held to anticipate those claims.

Rejection of Claims 8 and 10 Under 35 U.S.C. 103

Claims 8 and 10 stand rejected under 35 U.S.C. 103 as being obvious over Martinez-Tovar or Weiss in view of Benson et al. These claims are allowable at least because they depend from claim 1, which is allowable for reasons set forth elsewhere herein.

Rejection of Claims 4, 6, 8, 9 and 11-24 Under 35 U.S.C. 103

Claims 4, 6, 8, 9 and 11-24 stand rejected under 35 U.S.C. 103 as being unpatentable over Martinez-Tovar in view of Weiss. The Examiner asserts that it would have been obvious to provide the semiconductor bridge of Martinez-Tovar with the titanium-hafnium bridge of Weiss. (The Examiner's comments regarding titanium-hafnium are taken to mean titanium hydride, for consistency with Weiss.)

The basis for the stated ground of rejection is respectfully traversed on the grounds that a person of ordinary skill in the art would not be motivated to employ the titanium-hydride bridge shown by Weiss in the initiation device of Martinez-Tovar, as proposed by the Examiner. This is because titanium hydride is not thermally stable and decomposes at a local temperature of about 450°C, according to Weiss (see page 3, paragraph 1, of the enclosed translation), and Martinez-Tovar teaches away from the use of such materials in order to function as a localized heat generator (see page 16, lines 16-25).

In any case, claims 4, 6, 8, 9, 11, 13-17, 19, 20 and 22-24 are all allowable at least because they depend from base claims that are allowable for reasons set forth elsewhere herein. In addition, claim 12 provides a different distinction relative to Weiss, by specifying that the titanium layer on the semiconductor bridge has been preconditioned against temperature-induced variations in resistance. No such preconditioning is disclosed or suggested by Martinez-Tovar or Weiss, so claim 12 and the claims dependent therefrom are clearly patentably distinct from the applied references.

Rejection of Claims 1-7, 9 and 11-24 on Double-Patenting Grounds

Claims 1-7, 9 and 11-24 stand rejected under the doctrine of obviousness-type double patenting in view of various claims of U.S. 6,133,146 to Martinez-Tovar. This ground of rejection is respectfully traversed on the grounds that each of the claims in the cited U.S. patent require a layer of tungsten on the semiconductor bridge whereas tungsten is excluded from the bridge of independent claims 1 and 18 and claims 2-7, 9, 11, 15-17, 19 and 20 dependent therefrom, thus rendering the claims patentable even over the cited claims of Martinez-Tovar, for reasons discussed above. Similarly, claim 12 defines a semiconductor bridge igniter having a particular type of titanium on the semiconductor bridge portion, i.e., titanium that has been preconditioned to be stabilized against temperature-induced variations in resistance. Since the preconditioning of titanium is nowhere suggested in the prior art, this limi-

tation in claim 12 and in claims 13, 14 and 17 provides a patentable distinction over the claims of Martinez-Tovar.

Claim 21 has been canceled, but claim 22 and the claims dependent therefrom define a method for initiating an energetic material that cannot be achieved using the device described in the claims of Martinez-Tovar, for reasons discussed above in addressing the rejection of that claim in view of Benson.

It should now be clear that the various claims of U.S. 6,133,146 in no way render obvious any of the claims now pending in the above-captioned application.

Rejection of Claims 1-24 on Double-Patenting Grounds

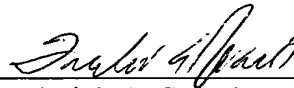
Claims 1-24 stand rejected under the doctrine of obviousness-type double patenting as being unpatentable over various claims of U.S. 6,133,146 of Martinez-Tovar in view of Benson et al. This ground of rejection is respectfully traversed on the grounds that Benson et al shows only a semiconductor bridge device having a layer of tungsten thereon and provides no motive for eliminating the tungsten from the combined layers of tungsten and titanium defined in the claims of Martinez-Tovar. Therefore, even in view of the combination of Martinez-Tovar and Benson et al, claims 1 and 18 of the subject application, and the claims dependent therefrom, define a semiconductor bridge device having a layer of titanium without tungsten, define subject matter that is patentably distinct from Martinez-Tovar, for reasons discussed above. Likewise, claim 12 defines a semiconductor bridge having preconditioned titanium thereon, and nowhere does Benson et al or Martinez-Tovar teach or suggest the preconditioning of titanium or the unexpected benefit deriving therefrom, so claim 12 and the claims dependent therefrom are patentably distinct from the claims of Martinez-Tovar. Finally, claim 22 defines a method of initiating an energetic material that, for reasons discussed above, cannot be achieved using the device defined in the claims of Martinez-Tovar because the presence of tungsten in all of those claims prevents the Martinez-Tovar device from functioning in the claimed manner, and Benson et al fails to provide a suggestion for the elimination of tungsten.

New Claims 25-35

New claims 25-34 are drawn to a specific embodiment of the invention in which the metal layer on the semiconductor bridge consists of titanium. These claims are thus consistent with the subject matter previously allowed by the Examiner. New claim 35 presents the subject matter of canceled claim 19 with added dependency to claim 25.

Each of the stated grounds of rejection have been addressed or traversed. Reexamination and reconsideration of the rejected claims is respectfully requested.

Respectfully submitted,

A handwritten signature in cursive script, appearing to read "Frederick A. Spaeth", is written over a horizontal line.

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